



浙江大学
ZHEJIANG UNIVERSITY

Orko: Facilitating Multimodal Interaction for Visual Exploration and Analysis of Networks

InfoVis 2017

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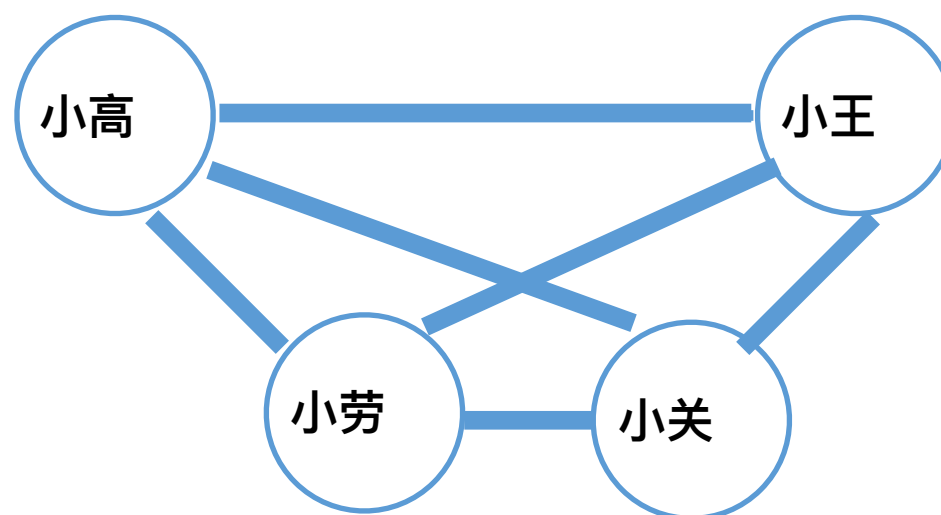
Graphiti: Interactive Specification of Attribute-based Edges for Network Modeling and Visualization



Fig. 1. Graphiti's Interface: (A) Data Input Row (B) Visualization Canvas (C) Network Metrics Container (D) Node Details Container (E) Quick Access Controls (F) Recommendations Panel (G) Edge Type Panel (H) Download Network Button



举例-VAG数据集



身高差不多:180cm, 182cm	边	加入到
年级:研三	边	加入到
掌握技能:JavaScript, Python	边	加入到
大家评价: 帅, 优秀	边	加入到

边类型：2个条件：大家评价：帅，优秀
 年级：研三

Towards a Dialogue System that Supports Rich Visualizations of Data

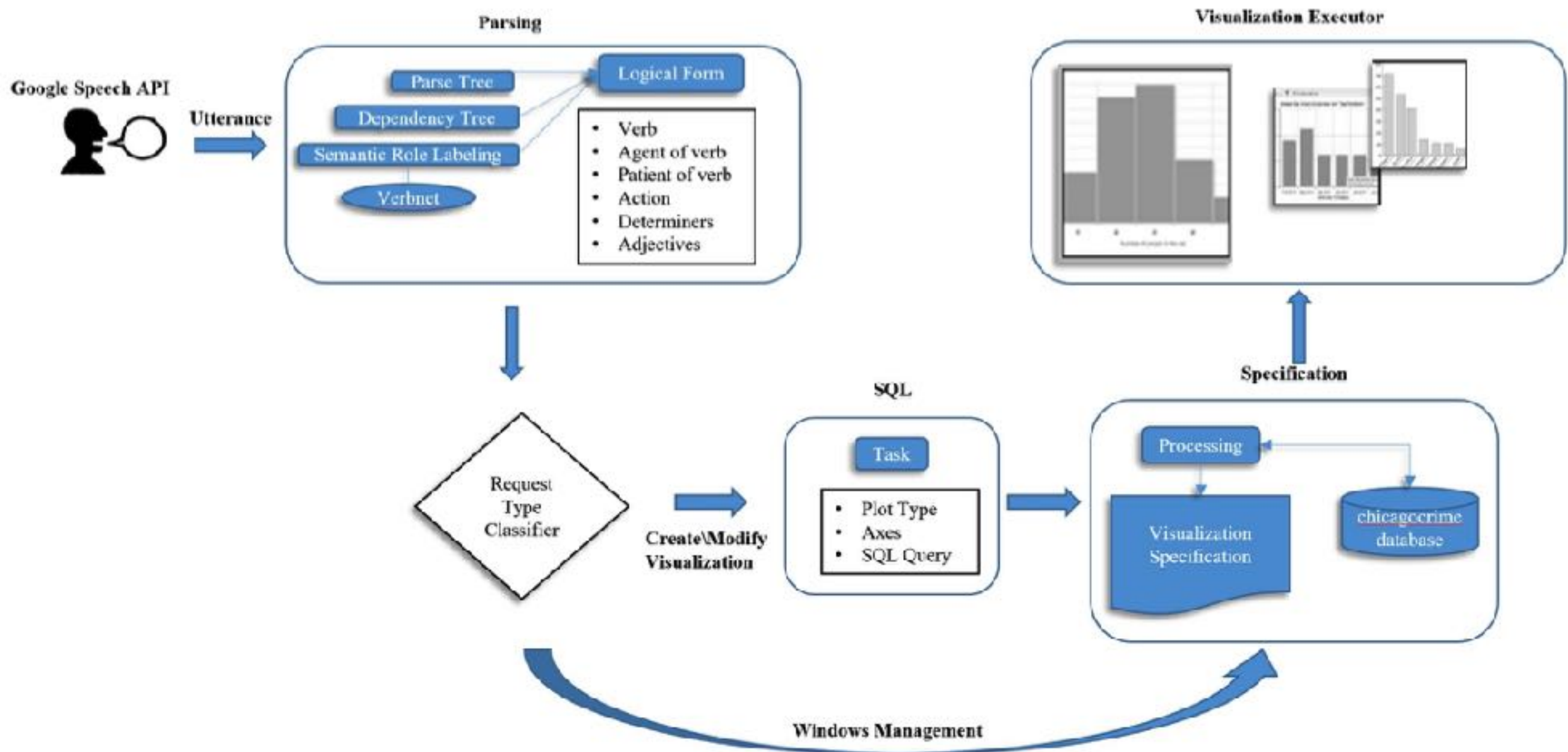
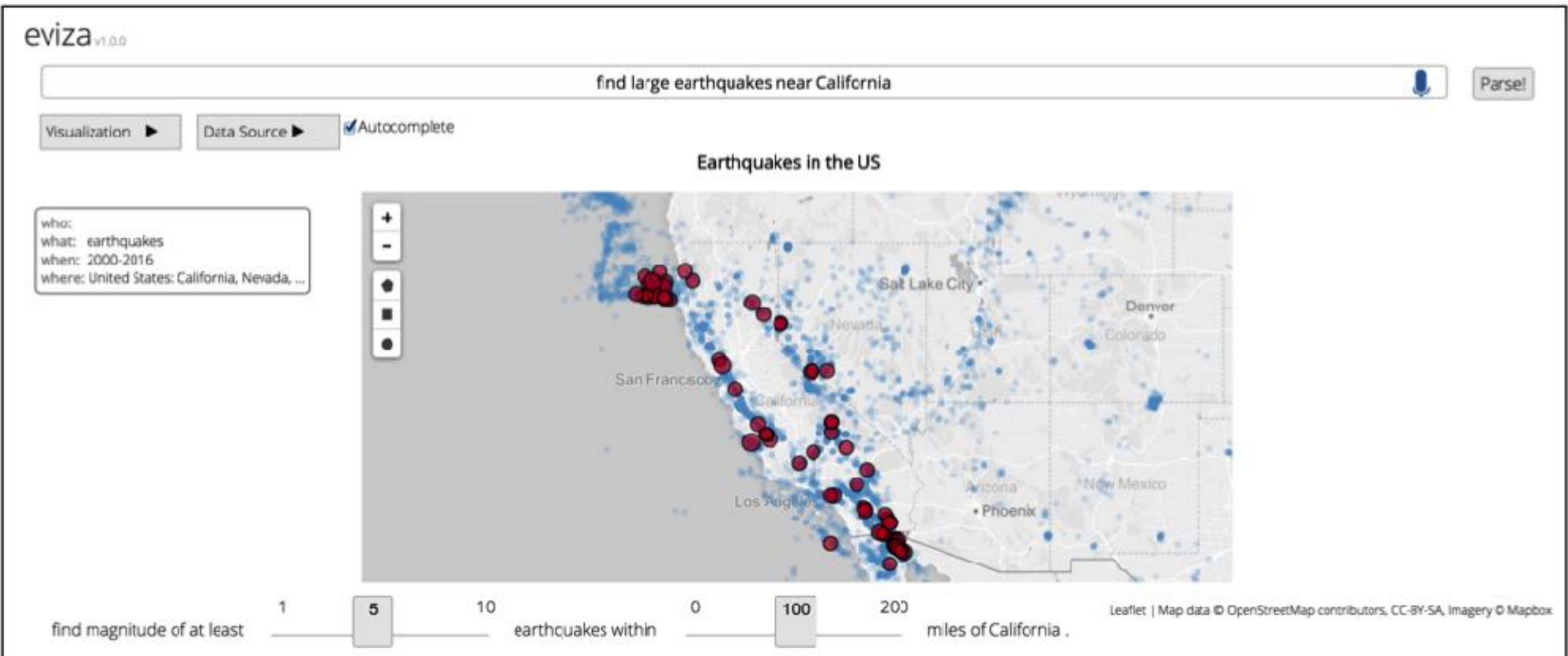


Figure 2: NL-to-Visualization Pipeline

Eviza: A Natural Language Interface for Visual Analysis



挑战

- 查询多样化
 - 明确的
 - 上下文相关的
 - 高级别
- 相同查询，多种问法

Explicit	Find Ronaldo. — Show Pepe's connections. — Show connections between Pogba and Bale. — Show the shortest path from Evra to Kroos. — Color by position. — Size nodes by betweenness centrality. — What is the clustering coefficient of this network. — Only show German forwards. — Clear all filters. — Resize graph to fit the screen. — Add a filter widget for country. — Change value of the age slider to show players over the age of 30. — Change red nodes to blue.
Follow-up & Contextual	Are any of these players right footed. — Filter by this player's club. — Show connections of these players. — Do any of these players play for the same club and national team. — Show the different countries players come from. — Ronaldo and Rooney. — Color nodes by country > Now club > How about position?
High-level	How are France and Italy connected. — Players from which countries tend to play more with clubs in the same country. — Which clubs have more left footed players. — Which countries have highest number of common players. — Modify the network layout to focus on England players. — Which three nodes have highest betweenness centralities. — Modify layout to show least edge crossings. — Find clusters.

⇒ (a) Possible query types

Show nodes connected to Ronaldo.

Show Ronaldo's connections.
Find players linked to Ronaldo.
Highlight players who play with Ronaldo.
Which players play in the same team as Ronaldo.
Show nodes directly connected to Ronaldo.
Find nodes adjacent to Ronaldo.
Show Ronaldo's teammates.
Who all is Ronaldo directly connected to.
Find players with a direct link to Ronaldo.
Find direct connections of Ronaldo.

(b) Different ways of asking the same query

贡献

- 可视化任务分类
 - 查询和交互
- Orko系统
- 评估

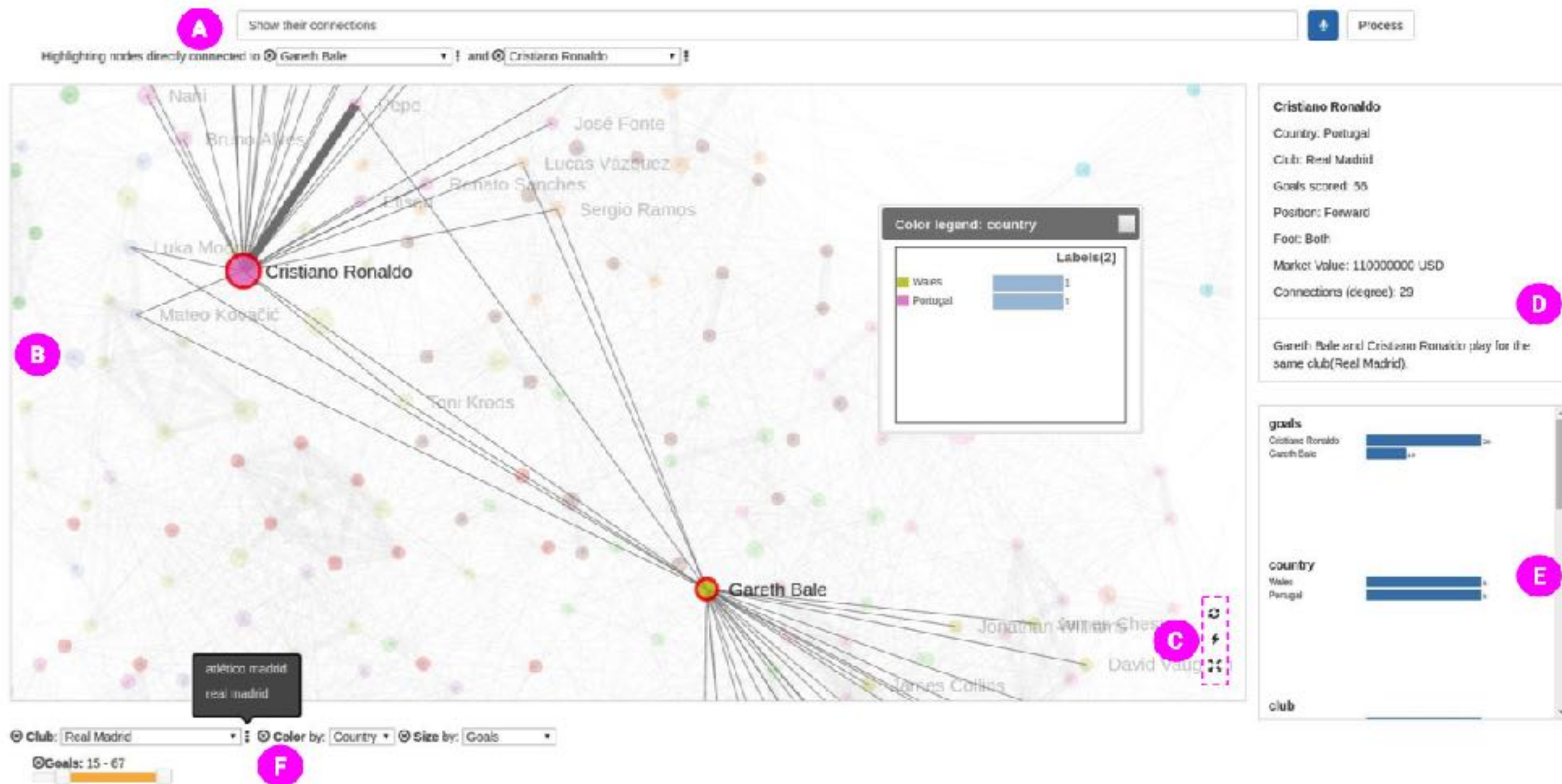


目标

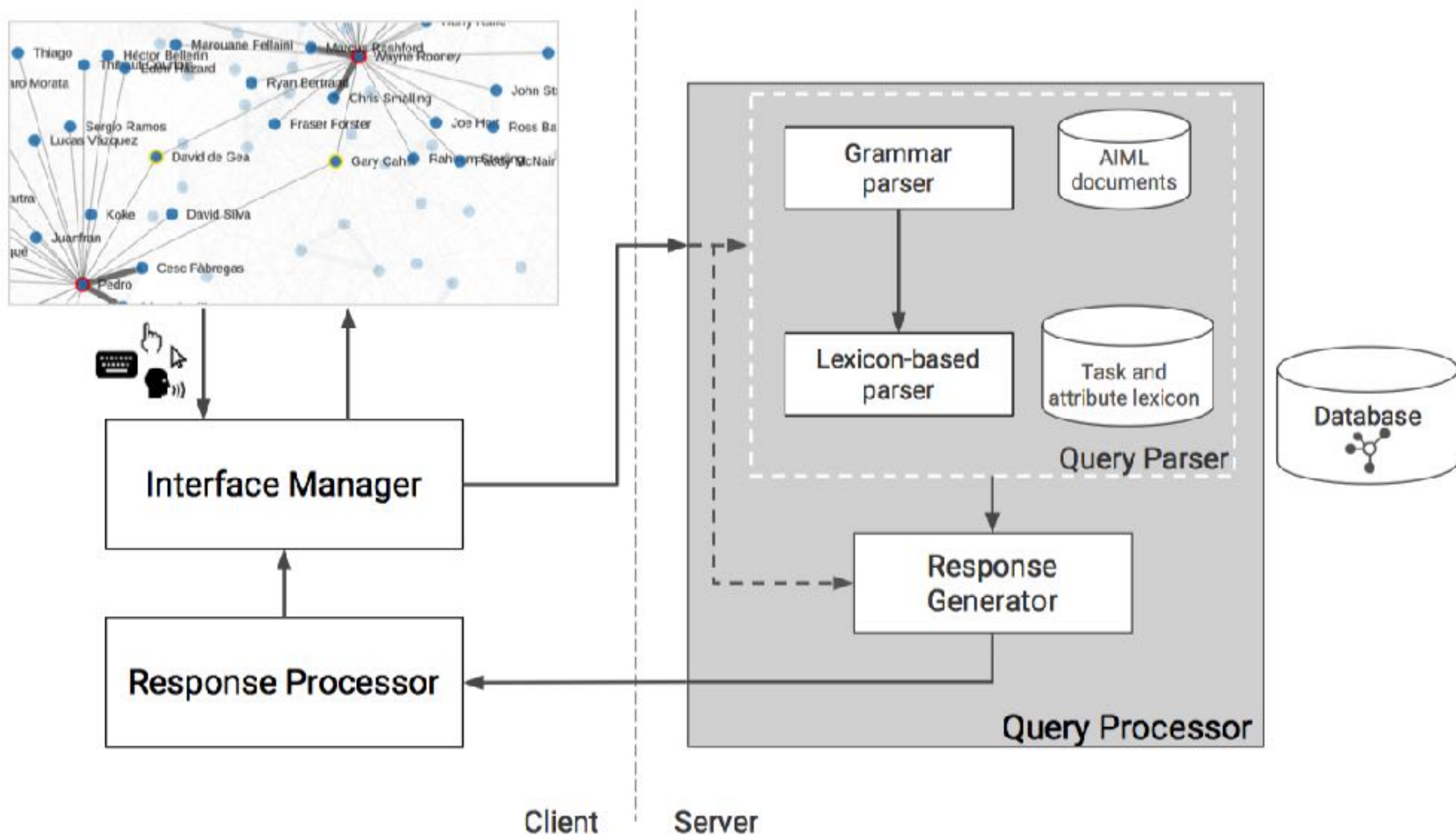
- 支持多重任务
 - 基于拓扑
 - 基于属性
 - 上下文任务等
- 多种输入集成
 - 触摸
 - 语音
 - 鼠标等



系统



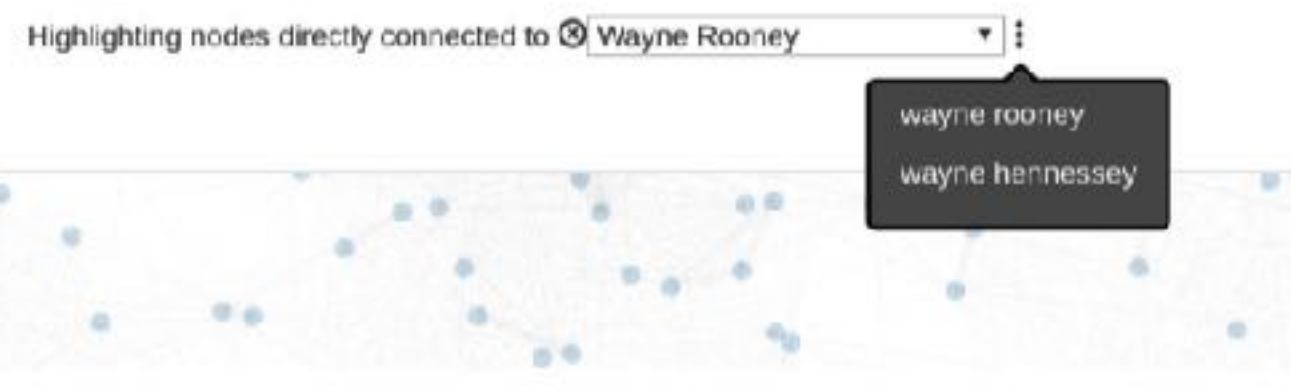
系统



系统-交互模块



(a)



(b)

Ronaldo and Rooney



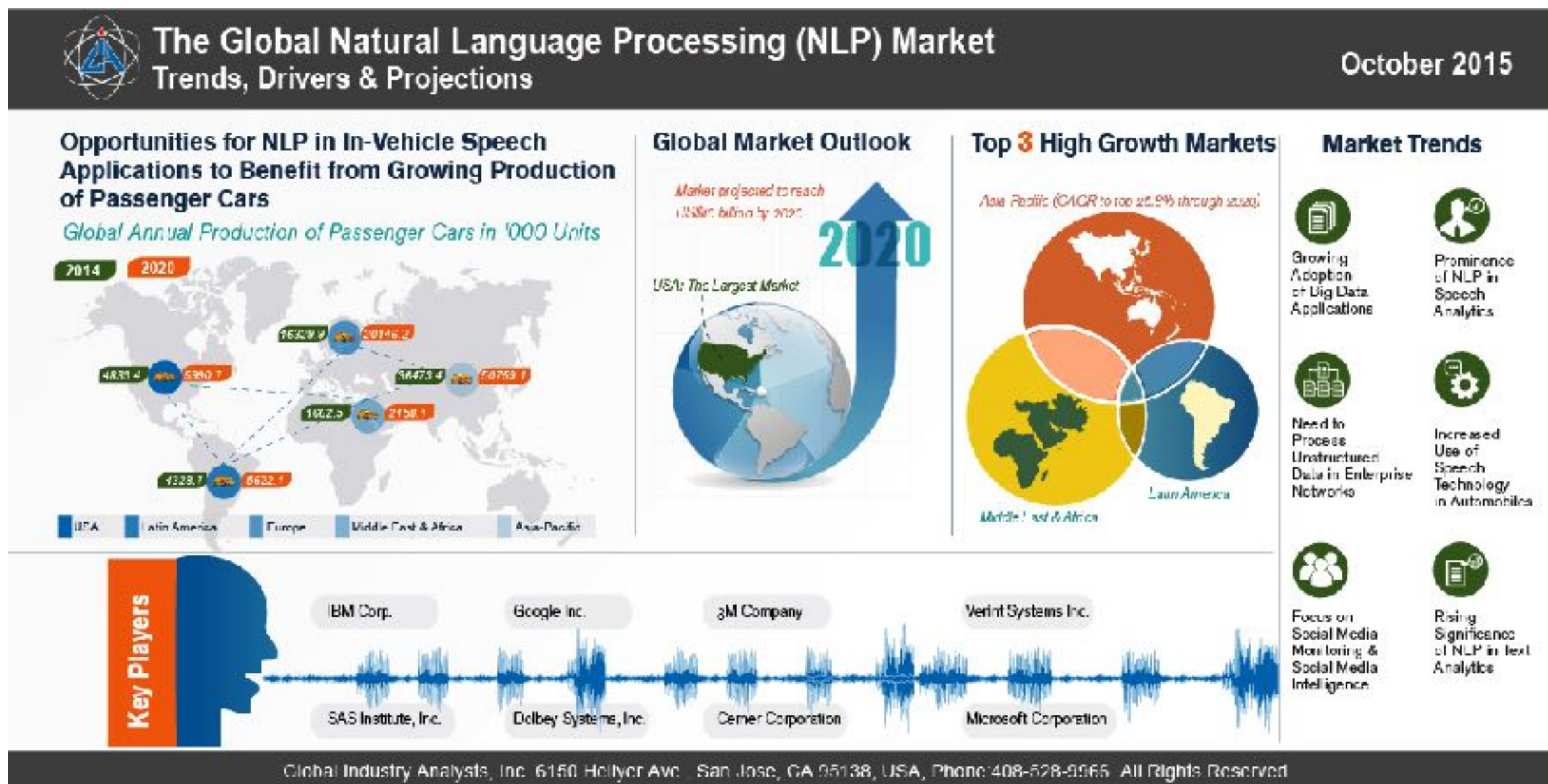
系统-处理模块

- HTML5 webkit speech recognition API
- Grammar-Based (语法)
 - AIML interpreter (PyAIML)
- Lexicon-Based (词汇)
 - NLTK
 - Stanford CoreNLP



自然语言处理 (NLP/Natural Language Processing)

● 自然语言转化为计算机程序更易于处理的形式

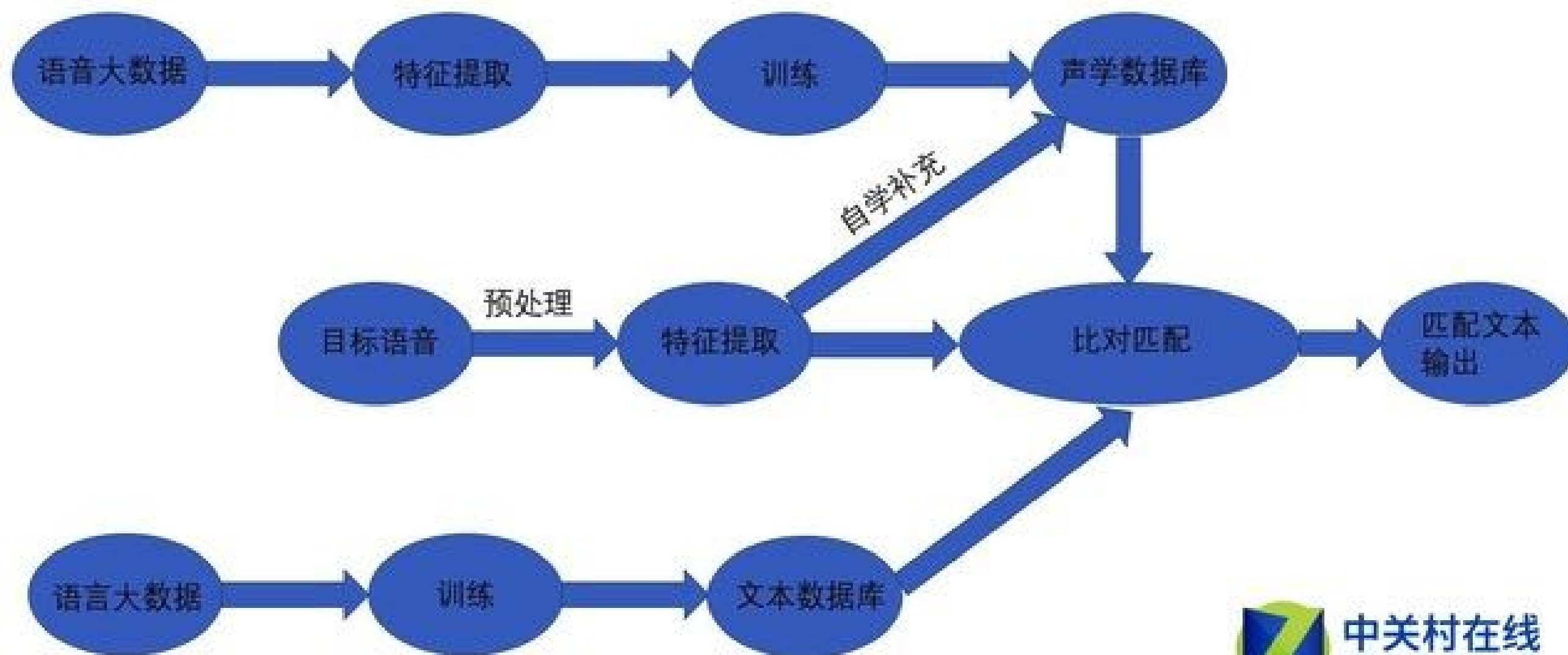


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HTML API



系统-处理模块

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AIML: Artificial Intelligence Markup Language

```
<category>  
  <pattern>WHAT ARE YOU</pattern>  
  <template>  
    <think><set name="topic">Me</set></think>  
    I am the latest result in artificial intelligence,  
    which can reproduce the capabilities of the human brain  
    with greater speed and accuracy.  
  </template>  
</category>
```



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Lexicon-词性标注 (PoS/Part of speech tagging)



Part Of Speech Tagging

- Introduction -



Lexicon-实体提取 (Entity Extraction)

命名实体识别(NER)

Named Entity Recognition:

		Date	Time		Location		Person	
1	At the W party	Thursday	night	at	Chateau Marmont,	Cate Blanchett	barely made it up in the elevator.	

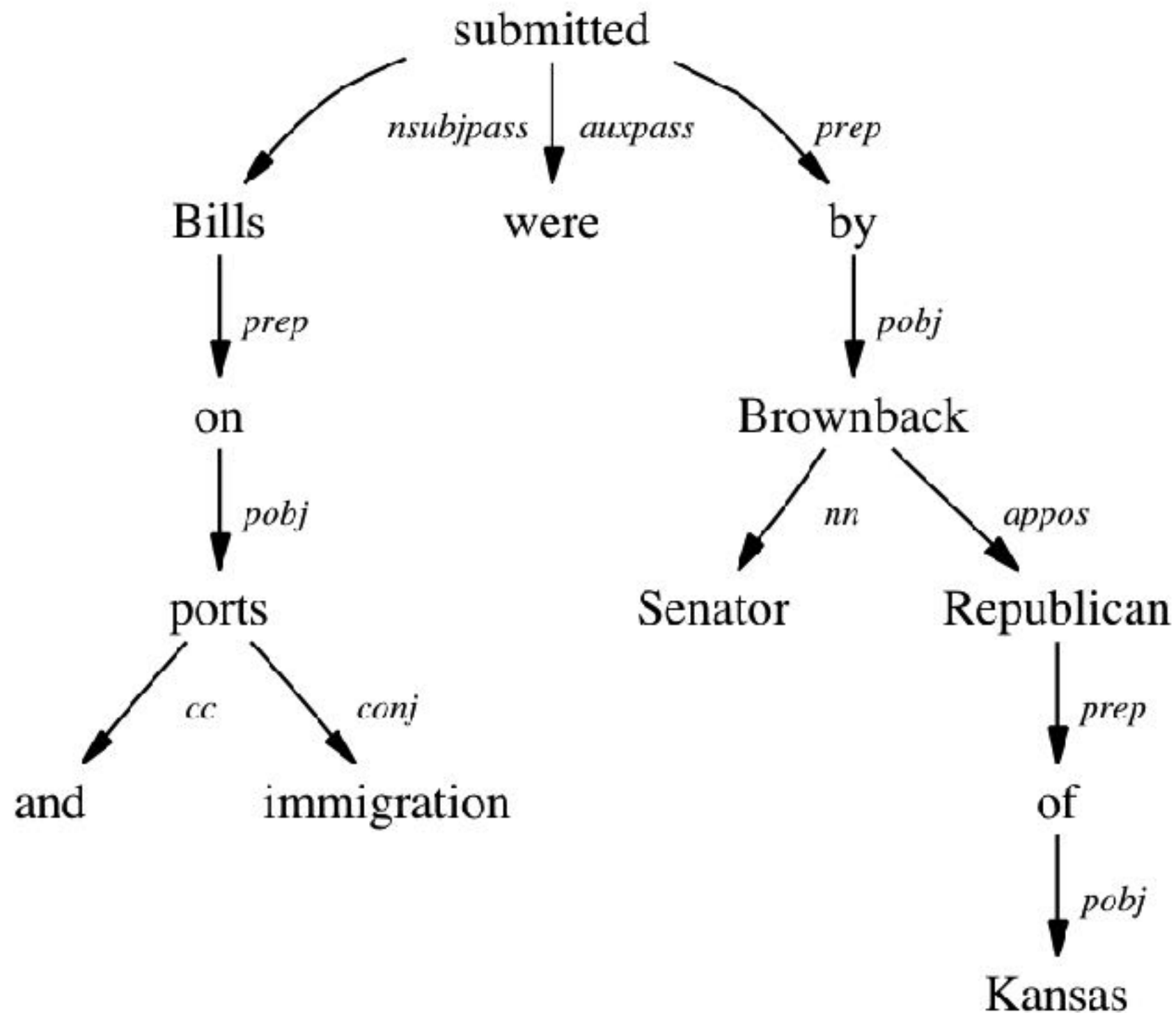
主题建模

“Arts” “Budgets” “Children” “Education”

The William Randolph Hearst Foundation will give \$1.25 million to Lincoln Center, Metropolitan Opera Co., New York Philharmonic and Juilliard School. “Our board felt that we had a real opportunity to make a mark on the future of the performing arts with these grants an act every bit as important as our traditional areas of support in health, medical research, education and the social services,” Hearst Foundation President Randolph A. Hearst said Monday in announcing the grants. Lincoln Center’s share will be \$200,000 for its new building, which will house young artists and provide new public facilities. The Metropolitan Opera Co. and New York Philharmonic will receive \$400,000 each. The Juilliard School, where music and the performing arts are taught, will get \$250,000. The Hearst Foundation, a leading supporter of the Lincoln Center Consolidated Corporate Fund, will make its usual annual \$100,000 donation, too.



Lexicon-依存关系树 (Dependency Tree)

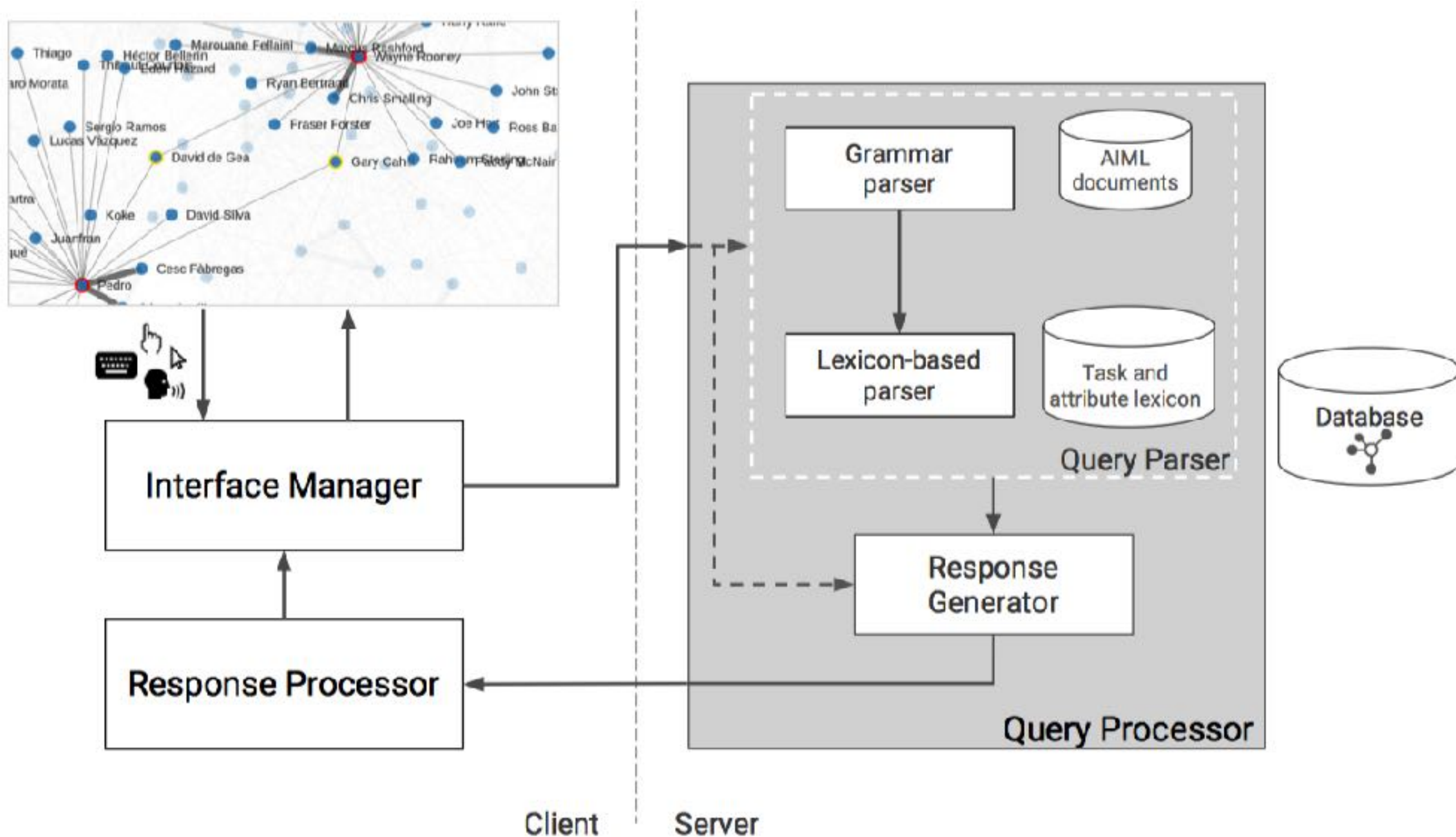


Lexicon–语义相似度 (Semantic Similarity)

- cosine similarity
- Wu–Palmer metric
- Resnik similarity
- Jiang and Conrath similarity



系统

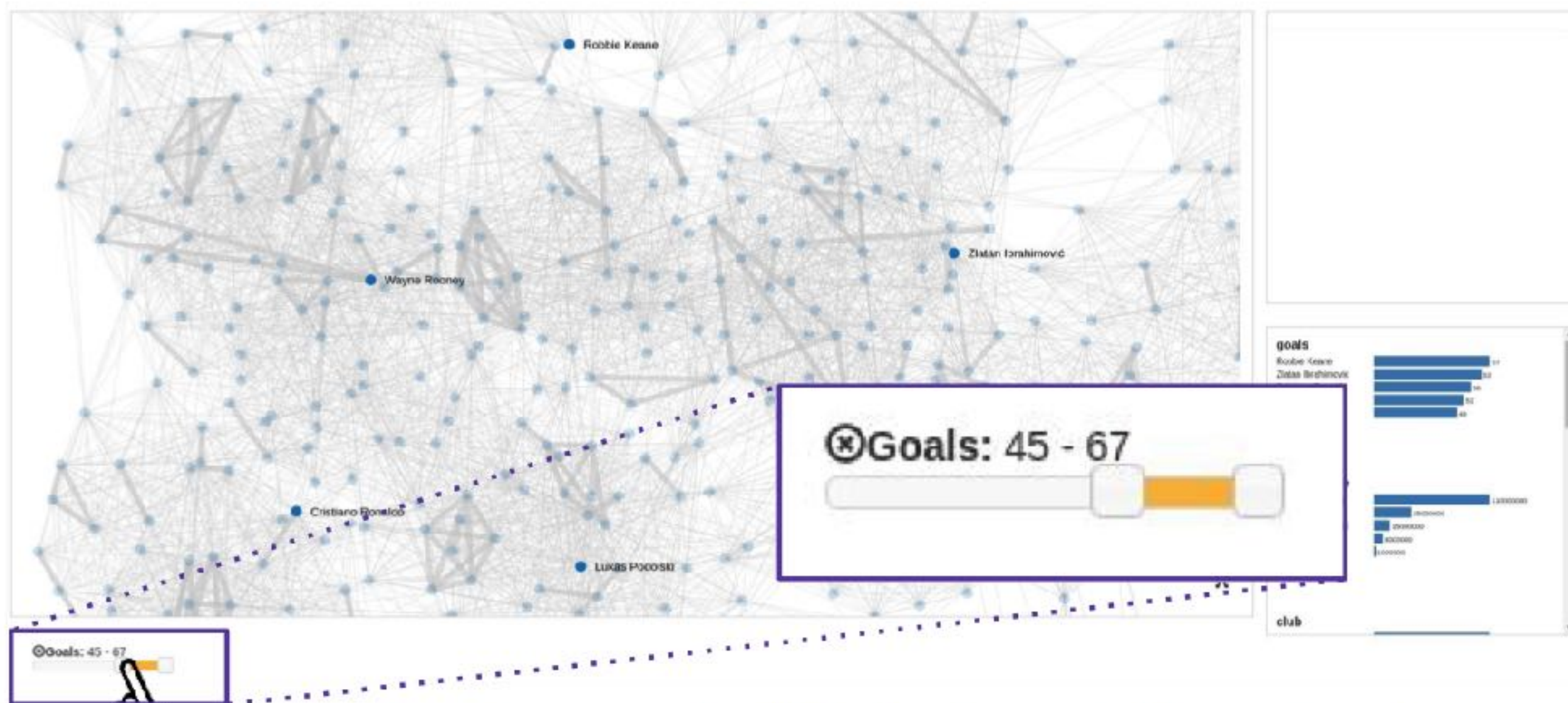


使用场景

- 欧洲足球运动员
 - 552球员（节点）
 - 进球数
 - 年龄
 - 俱乐部
 - 国家等
 - 6772关系（边）
 - 同一个俱乐部或国家队



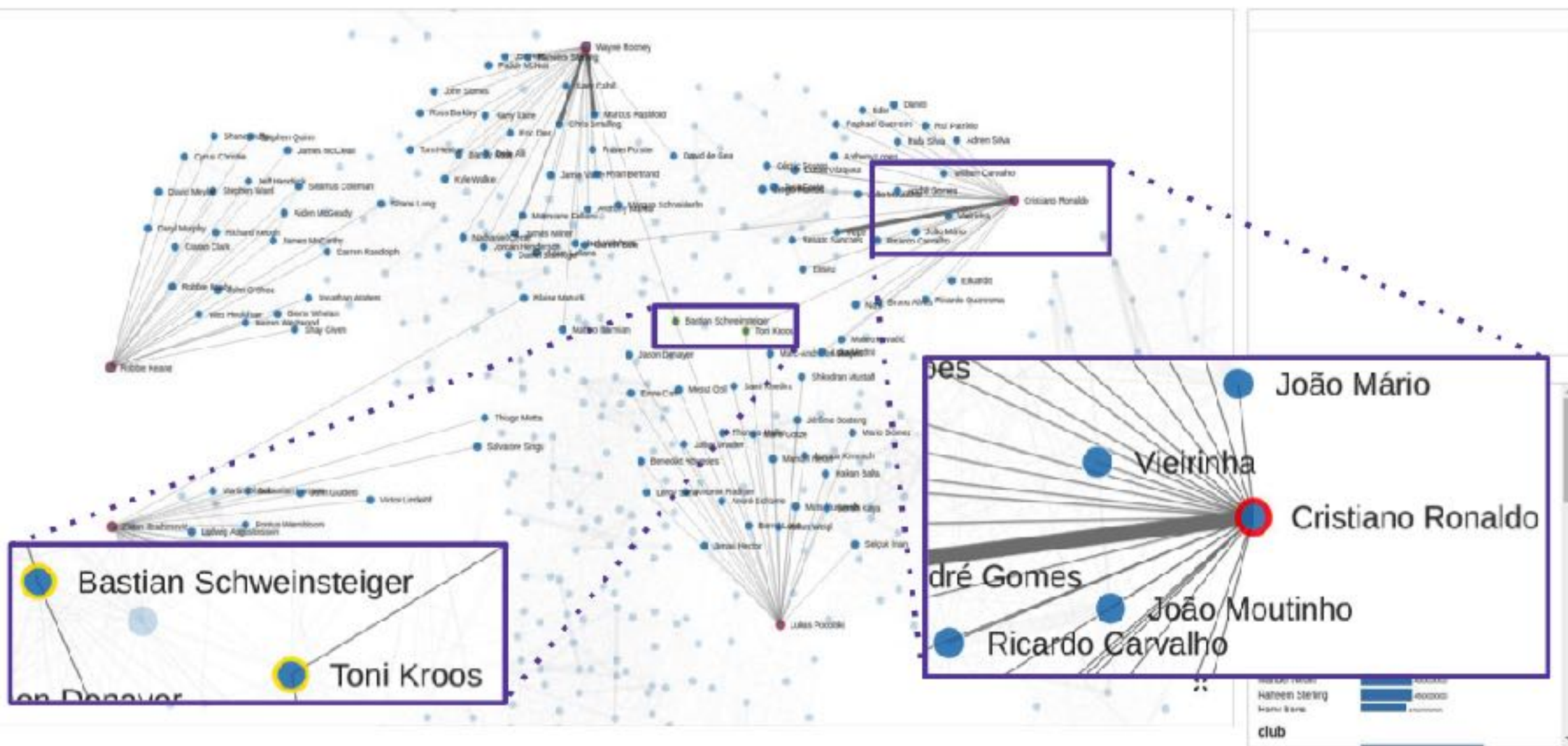
使用场景



(a) Top 5 goal scorers are highlighted as the goals slider is adjusted.



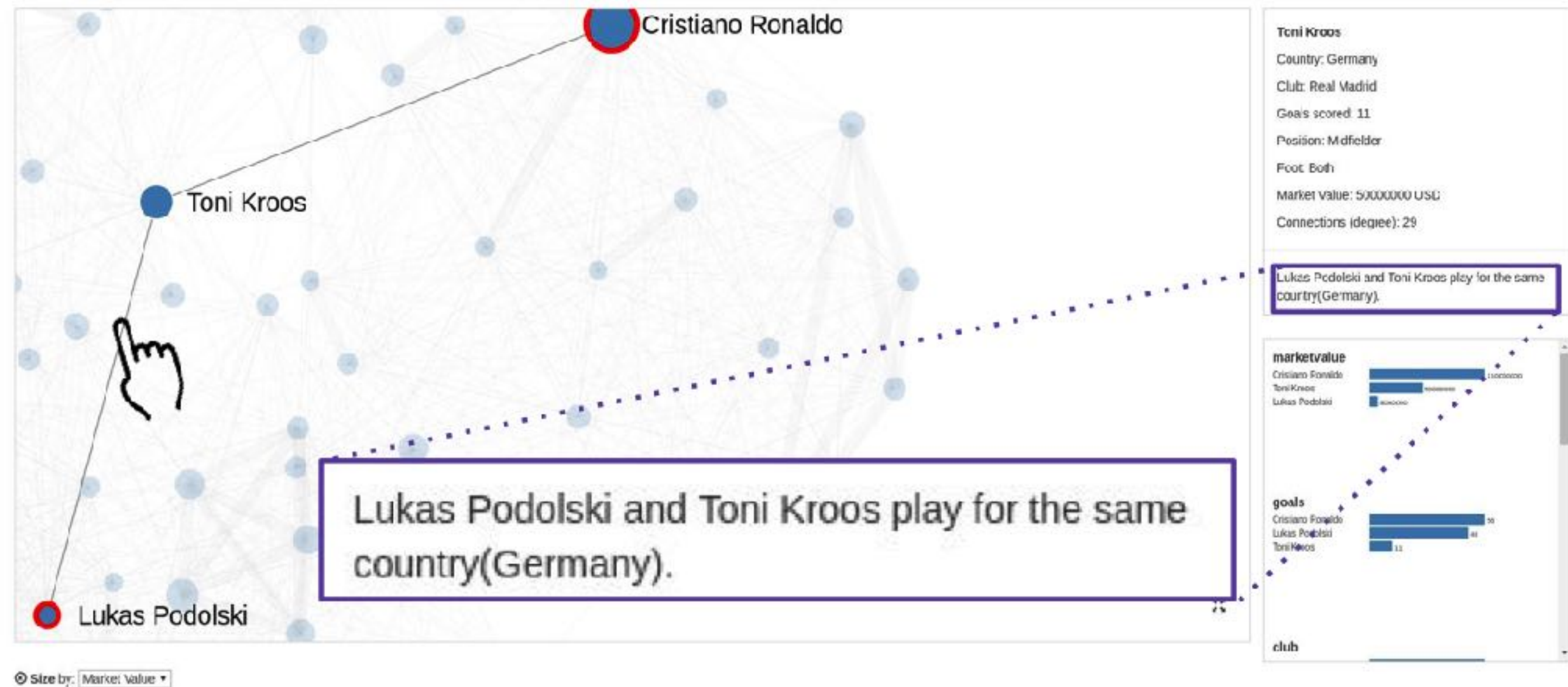
使用场景



- (b) Connections of top 5 goal scorers (indicated using a red stroke) are highlighted. Common connections are emphasized using a yellow stroke.



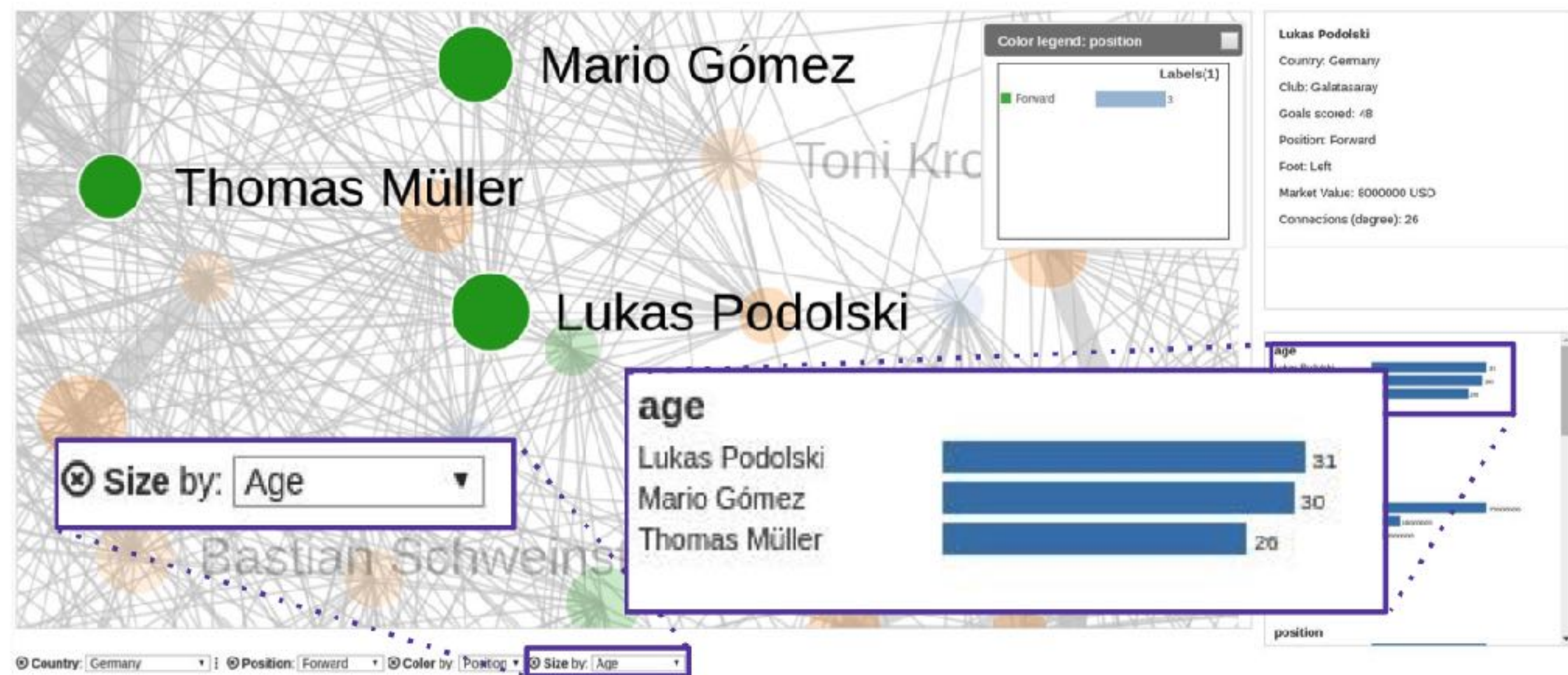
使用场景



- (c) Path between Ronaldo to Podolski is highlighted. Connection between Podolski and Kroos is displayed.



使用场景



- (d) Player nodes are re-sized by age. Summary panel is re-organized to facilitate expedited exploration.



使用场景



评估

- 系统可用性
- 用户反馈
- 观测数据



评估-系统可用性

	P1			P2			P3			P4			P5			P6			
	S	T	ST	S	T	TS	S	T	ST	S	T	ST	S	T	ST	S	T	ST	TS
T1			1	2					1			1			1	1			
T2	2			1			1					1			1	1			
T3	2	2	1	3	1		1		1	3	1		3	1		2			
T4	2		1	3			4					3		6		3			
T5	2			2				1	1			1	2	4		4	1	1	
T6	1		1	1				2	1	1			1	3		4			
T7	1	1		2	3		1	1	1		1	1	3	1		2	2		
T8	1		1	1			1	1	1			1	2	1		1			
T9	2			2					2	2			2	1		1		2	
T10	2	2	2	8	1	2		6	2	2	5		2	5		2	3		1

● 多种 (18.3%)

● 同时 (0)



评估-用户反馈

	P1	P2	P3	P4	P5	P6	Average
Overall SUS scores (out of 100)	80	70	82.5	80	52.5	87.5	75.42
Would want to use the system frequently (out of 5)	4	5	5	5	3	5	4.5
Found various functions well integrated (out of 5)	5	5	4	3	5	4	4.33
Natural language query interpretation (out of 5)	4	4	3	4	4	5	4



总结

- 优点
 - 多种交互对于图探索的启发
- 缺点
 - 实验人数太少
 - 问题没有详细分类
 - 触摸手势单一

